



مولانا آزاد نیشنل اردو یونیورسٹی  
MAULANA AZAD NATIONAL URDU UNIVERSITY  
(A Central University established by an Act of Parliament in the year 1998)  
Department of Zoology  
B.Sc. (Life Sciences) I- Semester  
Theory Syllabus: Non-Chordates

Paper Code: BSZY101CCT  
Instruction: 4 h / week  
Credits: 4

Semester Exam: 70 Marks  
Duration: 3 hours  
Internal Assessment: 30 Marks

#### UNIT-I

- 1.1: **Basis of animal classification**, Zoological nomenclature, concepts of taxonomy & systematics.
- 1.2: **Phylum Protozoa**: General characters and classification upto classes; Structure, life cycle and clinical significance of human protozoan Parasites and their diseases (Balantidiasis, Amoebiasis, Giardiasis, Leishmaniasis, Malaria, Trichomoniasis, Sleeping sickness and Chagas disease).
- 1.3: **Phylum Cnidaria**: General characters and classification upto classes: Polymorphism in Coelenterates; Corals and Coral reef formation with their significance.
- 1.4: **Phylum Porifera**: General characters and classification upto classes: Canal system in Sponges; integumentary system in sponges.

#### UNIT-II

- 2.1: **Phylum Platyhelminthes**: General characters and classification upto classes; life cycle of *Fasciola hepatica*, and *Taenia solium*
- 2.2: **Phylum Nematelminthes**: General characters and classification up to classes; Life history of *Ascaris lumbricoides* and its parasitic adaptations
- 2.3: **Phylum Annelida**: General characters and classification up to classes; Metamerism in Annelida; Significance of Hirudin of Leech

#### UNIT-III

- 3.1: **Phylum Onychophora**: General characters and classification upto classes: Taxonomic position of Peripatus and its affinities with Annelida and Arthropoda.



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- 3.2: Phylum Arthropoda:** General characters and classification upto classes: Vision in Arthropoda, Metamorphosis in Insects; Economically and Medically important Arthropods. Gregarious behavior of insects.
- 3.4: Phylum Mollusca:** General characters and classification up to classes; Torsion in gastropods

#### UNIT-IV      **Phylum Echinodermata and Hemichordata**

- 4.1: Phylum Echinodermata:** General characters and classification up to classes; Water-vascular system in Asteroidea; Affinities of Echinoderm with Hemichordates and chordates.
- 4.2: Phylum Hemichordata:** General characters and Affinities of *Balanoglossus* with chordates and non-chordates.



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**Practical-I: Non-Chordate**

Paper Code: BSZY150CCP  
Instruction: 4 h / week  
Credits: 2

Semester Exam: 35 Marks  
Duration: 3 hours  
Internal Assessment: 15 Marks

- 1) Theoretical and practical knowledge of simple and compound microscope.
- 2) Identification, Classification and comments on the slides/specimens of;
  - **Protozoa:** *Amoeba, Euglena, Plasmodium, Paramecium, Trypanosoma, Elphidium, Vorticella,*
  - **Porifera:** *Sycon, Hyalonema, and Euplectella*
  - **Cnidaria:** *Hydra, Obelia, Physalia, Aurelia, Tubipora*
  - **Platyhelminthes:** *Fasciola, Taenia and their larvae,*
  - **Aschelminthes:** *Ascaris, Ancylostoma, Wuchereria,*
  - **Annelida:** *Pheretima, Hirudinaria (Leech), Nereis,*
  - **Arthropoda:** *Palaemon (Prawn), Crab, Palamnaeus (Scorpion)*
  - **Mollusca:** *Pila (Apple snail), Lamellidens (Unio), Sepia, Octopus*
  - **Echinodermata:** *Asterias (Sea Star), Echinus (Sea urchin)*
  - **Hemichordata:** *Balanoglossus*
- 3) Demonstration of earthworm Nerve ring and Ovaries; appendages of arthropods

**References:**

1. Barnes, R.D. (1982). *Invertebrate Zoology*, V Edition
2. Janet Moore (2006). *An Introduction to the Invertebrates*, Cambridge University Press 2006
3. Jan Pechenik (2014). *Biology of the Invertebrates*, McGraw-Hill Science, 2014
4. Kotpal Volumes Protozoa through Echinodermata, Rastogi Publications
5. Jordan & Verma (revised editions) *Invertebrate Zoology*, S. Chand and Co. Ltd., New Delhi.



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**B.Sc. (Life Sciences) II- Semester**

**Theory Syllabus: Chordates**

Paper Code: BSZY201CCT

Semester Exam: 70 Marks

Instruction: 4 h / week

Duration: 3 hours

Credits: 4

Internal Assessment: 30 Marks

**(A) General account of Chordates**

**Unit I.**

Chordates: Introduction and origin; Protochordates - General features and Phylogeny of Hemichordates, Urochordates and Cephalochordates. Retrogressive metamorphosis; Agnatha - General features of Agnatha and classification of cyclostomes up to classes; Pisces - General features and Classification up to orders; Osmoregulation in Fishes; Migration and Parental care in fishes

**Unit II.**

Amphibian Classification upto orders, Parental care; Reptiles - Classification upto orders. Poisonous and non- poisonous snakes in India, Biting mechanism in snakes; Aves - Classification upto orders, Types of feathers, flight adaptations, Mechanism of flight and Migration. Mammals - Classification upto orders. Origin of Mammals.

**(B) Comparative anatomy of chordates**

**Unit III.**

Integumentary System - Derivatives of integument w.r.t. glands and digital tips; Skeletal System, Evolution of visceral arches; Digestive System -Brief account of alimentary canal and digestive glands; Respiratory System -Brief account of Gills, lungs, air sacs and swim bladder

**Unit IV.**

Circulatory System - Evolution of heart and aortic arches; Urino-genital system- Succession of kidney, Evolution of Urino-genital ducts; Nervous System -Comparative account of brain; Sensory organs -Types of receptors



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**B.Sc. (Life Sciences) II- Semester**

**Chordates**

**Practical Syllabus**

Paper Code: BSZY250CCP

Instruction: 4h / week

Credits: 2

Semester Exam: 35 Marks

Duration: 3 hours

Internal Assessment: 15 Marks

**(A) General account of Chordates**

1. Identification, Classification and comments on the specimens of:

**Protochordates:** *Herdmania; Amphioxus*

**Pices:** *Branchiostoma, Petromyzon, Sphyrna, Pristis, Torpedo, Labeo, Exocoetus, Anguilla,*

**Amphibia:** *Ichthyophis/Ureotyphlus, Salamandra, Bufo, Hyla*

2. Estimation of age of fishes through Scales
3. Isolation of Placoid Scales.
4. Isolation of Weberian Ossicles/Accessory respiratory organ/cranial nerve from fishes.
5. Report submission on the identification, Classification and characters of Reptiles, Aves, and Mammals species seen during the visit of Zoological Park and the Campus.

**(B) Comparative anatomy:**

1. Types of scales in fishes; Feathers in birds; Integumentary organs in mammals
2. Collection and characterization of various kinds of feathers
3. Skeleton of fowl and rabbit
4. Mammalian skulls: One herbivorous and one carnivorous animal.
5. Dentition in mammals

**Suggested Books:**

- Kardong, K.V. (2005) *Vertebrates' Comparative Anatomy, Function and Evolution*. IV Edition. McGraw-Hill Higher Education.
- Kent, G.C. and Carr R.K. (2000). *Comparative Anatomy of the Vertebrates*. IX Edition. The McGraw-Hill Companies.
- Hilderbrand, M and Gaslow G.E. *Analysis of Vertebrate Structure*, John Wiley and Sons.
- Cleveland P. Hickman et.al. (2008). *Animal Diversity*, McGraw-Hill Higher Education
- Peter J. Bryant (2009). *Biodiversity and Conservation* - University of California, Irvine
- Kotpal (2015). *Modern Textbook Of Zoology Vertebrates*, Rastogi publishers, New Delhi
- Jordan E.L. and Verma P.S. (2010). *Chordate Zoology*, S. Chand & Co, New Delhi



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Saxena, R.K. and Saxena, S. (2015). Comparative Anatomy of Vertebrates, Viva Books, Delhi

**B.Sc. (Life Sciences) III- Semester**

**Theory Syllabus: PHYSIOLOGY AND BIOCHEMISTRY**

**Core Course**

Paper Code: BSZY301CCT	Semester Exam: 70 Marks
Instruction: 4 h / week	Duration: 3 hours
Credits: 4	Internal Assessment: 30 Marks

**Unit- I**

Biomolecules and Metabolism- Carbohydrates: Classification and function of Carbohydrates, Carbohydrate metabolism - Glycolysis, Krebs cycle, Electron transport and oxidative phosphorylation.

Proteins: Amino acid structure, classification; Proteins structure, classification and functions a, Protein Metabolism - Transamination, Deamination and Urea Cycle.

Enzymes-classification, mechanism of action, enzyme inhibition, feedback inhibition-regulation of enzyme reactions,

Nucleic acids- Deoxyribose nucleic acid (DNA) and Ribose Nucleic Acid (RNA) structure (Primary and secondary) and functions. Coding and Non-coding RNA.

Lipids: Classification of Lipids, Lipid Metabolism - Fatty acid synthesis and Fatty acid oxidation.

**UNIT - II**

Physiology of Digestion- Extra and intracellular digestion, Digestion of Carbohydrates, Proteins, Lipids and Cellulose, Absorption and Assimilation of digested food; role of Gastrointestinal hormones indigestion.

Physiology of Respiration- External, Internal and cellular Respiration; Respiratory Pigments; Transport of oxygen, Oxygen dissociation curves. Bohr's effect, Transport of CO<sub>2</sub> - Chloride shift; Nervous and Chemical Regulation of respiration.

**Circulatory system** -Types of circulation - Open and Closed circulation; Structure of Mammalian Heart, Types of hearts - Neurogenic and Myogenic; Heart function -Conduction and regulation of heart beat, Regulation of Heart rate - Tachycardia and Bradycardia; Blood Clotting mechanism.

**UNIT - II**

**Physiology of Excretion** - Classification of Animals on the basis of excretory products- Ammonotelic, Uricotelic, Ureotelic, Structure and function of Nephron; Urine formation, Counter current mechanism. Osmoregulation - Water and ionic regulation by freshwater, brackish water and marine animals.

**Muscles**- Muscle Contraction, Ultra structure of skeletal muscle fibre, Sliding Filament theory, muscle contraction mechanism and energetics.

**Structure of Neuron**, Nerve impulse - Resting potential and Action potential and Conduction of Nerve impulse, Synapse, types of synapses and Synaptic transmission.

**UNIT - III**



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Reproduction and Endocrine System- Endocrine glands - Structure, secretions and functions of Pituitary, Thyroid, Parathyroid, Adrenal glands and Pancreas, Hormone action and concept of Secondary messengers, Male and Female Hormones, Hormonal control of Menstrual cycle in humans. Concept of Homeostasis, Mechanism of Homeostasis,

### B.Sc. (Life Sciences) III Semester Core Course - PHYSIOLOGY AND BIOCHEMISTRY Practicals

Paper Code: BSZY350CCP	Semester Exam: 35 Mar
Instruction: 4 h / week	Duration: 3 hou
Credits: 2	Internal Assessment: 15 Mar

1. Qualitative tests to identify functional groups of carbohydrates in given solutions  
(Glucose, Fructose, Sucrose, Lactose)
2. Separation of Amino acids by paper chromatography
3. Estimation of total protein in given solutions by Lowry's method.
4. Estimation of nucleic acids (DNA/RNA)
5. Preparation of hemin crystals
6. Blood clotting and coagulation time
7. Study of permanent histological sections of mammalian pituitary, thyroid, pancreas, adrenal gland,
8. Study of activity of salivary amylase under optimum conditions

### Suggested Readings

- \* Tortora, G.J. and Derrickson, B.H. (2009). Principles of Anatomy and Physiology, XII Edition, John Wiley & Sons, Inc.
- \* Widmaier, E.P., Raff, H. and Strang, K.T. (2008) Vander's Human Physiology, XI Edition., McGraw Hill
- \* Guyton, A.C. and Hall, J.E. (2011). Textbook of Medical Physiology, XII Edition, Harcourt Asia Pvt. Ltd/ W.B. Saunders Company
- \* Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006). Biochemistry. VI Edition. W.H Freeman and Co.
- \* Nelson, D. L., Cox, M. M. and Lehninger, A.L. (2009). Principles of Biochemistry. IV Edition. W.H. Freeman and Co.
- \* Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2009). Harper's Illustrated Biochemistry. XXVIII Edition. Lange Medical Books/Mc Graw3Hill.
- \* Singh. H.R, & Neeraj Kumar (2017) Animal Physiology and Biochemistry, Vishal Publishing Co



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- \* Nagabhushanam, (2008) , Textbook Of Animal Physiology, Oxford & IBH
- \* Rastogi, S.C. (2007). Essentials of Animal Physiology, New Age International Publishers

**B.Sc. (Life Sciences) IV-Semester**  
**Core Course - Genetics and Evolutionary Biology**

**Theory Syllabus**

Paper Code: BSZY401CCT	Semester Exam:	70 Marks
Instruction: 4 h / week	Duration:	3 hours
Credits: 4	Internal Assessment:	30 Marks

**Unit I:**

Introduction to Genetics: Inheritance and variation, Brief explanation on Mendel's work on transmission of traits (selection of experimental material and traits, hybridization, pure line, reciprocal crosses, maintenance of statistical records etc.), Molecular basis of Genetic Information (DNA and chromosome structure, replication, concept of gene); Importance of model organisms in the study of genetics;

Mendelian Principles of Inheritance and its extensions: Law of segregation, Law of Independent Assortment, test cross (3:1; 9:3:3:1; 1:1), chromosome theory of inheritance (mitosis and meiosis) Incomplete dominance and co dominance (1:2:1), Multiple alleles (ABO blood groups), Lethal alleles (2:1), Epistasis (12:3:1; 9:7; 15:1), Pleiotropy (sickle cell anaemia);

Inheritance patterns: Autosomal inheritance Vs Sex linked Inheritance (pedigree construction of various mode of inheritance, dominant eg., achondroplasia, recessive-eg., albinism, X-linked-eg., haemophilia and Y Linked eg., hypertrichosis), extra chromosomal inheritance (mitochondrial inheritance in human).

**Unit II:**





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Linkage Crossing over and gene mapping: Linkage and crossing over, Bateson and Punnet's experiment, Recombination frequency as a measure of linkage intensity, two factor and three factor crosses, Interference and coincidence, Somatic cell genetics - an alternative approach to gene mapping;

Sex determination: Chromosomal mechanisms of Sex Determination (grasshopper, birds, human), dosage compensation (Lyonization and Barr body);

Mutations: Chromosome Structural Mutations: standard Karyotype, Deletion, Duplication, Inversion, Translocation, chromosome numerical mutations: Non-disjunction, Aneuploidy (eg., trisomy 13,18 and 21; monosomy for X chromosome) and Polyploidy; Induced versus Spontaneous gene mutations (mutagen, somatic and germline mutations, substitution and frameshift mutations), Back versus Suppressor mutations.

### Unit III

History of Life, Major Events in History of Life, Introduction to Evolutionary theories, Lamarckism, Darwinism, Neo-Darwinism. Direct Evidences of Evolution, Types of fossils, Incompleteness of fossil record, Dating of fossils, Phylogeny of horse, Processes of Evolutionary Change, Organic variations; Isolating Mechanisms; Natural selection (Example: Industrial melanism); Types of natural selection (Directional, Stabilizing, Disruptive), Artificial selection

### Unit IV

Species Concept- Biological species concept (Advantages and Limitations); Modes of speciation (Allopatric, Sympatric), Macro-evolution, Macro-evolutionary Principles (example: Darwin's Finches), Extinction- Mass extinction (Causes, Names of five major extinctions, K-T extinction in detail), Role of extinction in evolution



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**B.Sc. (Life Sciences) IV-Semester**

**Core Course - Genetics and Evolutionary Biology**

**Practical Syllabus**

Paper Code: BSZY450CCP	Semester Exam: 35 Marks
Instruction: 4 h / week	Duration: 3 hours
Credits: 2	Internal Assessment: 15 Marks

1. Study of Mendelian Inheritance using *Pisum sativum* and *Drosophila* as model organisms and verification of results using Chi-square test.
2. Understanding the concept of multiple alleles by ABO blood grouping and its inheritance
3. Chromosome behaviour during cell division- Mitosis/Meiosis
4. Study of Linkage, recombination, gene mapping using the data.
5. Construction of three generation pedigrees and Study of Human Karyotypes (normal and abnormal).
6. Demonstration of inactive x-chromosome in buccal epithelial cells of human female
7. Study of fossil evidences from plaster cast models and pictures
8. Study of homology and analogy from suitable specimens/ pictures
9. Charts: a) Phylogeny of horse with diagrams/ cut outs of limbs and teeth of horse ancestors b) Darwin's Finches with diagrams/ cut outs of beaks of different species
10. Visit to Natural History Museum and submission of report

**Suggested Readings**

- \* Bhaskaran, K.K. & Biju Kumar, A.: Cell Biology, Genetics & Molecular Biology.
- \* Brooks, R. J.: Genetics: Analysis and Principles. 1999, Addison Wesley
- \* Gardner, E. J. et al.: Principles of Genetics. 8e, 200 J W & S.
- \* Robert H. Tamarin, Principles of Genetics.
- \* Ridley, M. (2004). *Evolution*. III Edition. Blackwell Publishing
- \* Barton, N. H., Briggs, D. E. G., Eisen, J. A., Goldstein, D. B. and Patel, N. H.(2007).
- \* *Evolution*. Cold Spring, Harbour Laboratory Press.
- \* Hall, B. K. and Hallgrimsson, B. (2008). *Evolution*. IV Edition. Jones and Bartlett Publishers
- \* Brian K. Hall & Benedikt Hallgrimsson (2013) Strickberger's Evolution Paperback , Jones & Bartlett Learning.



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**B.Sc. (Life Sciences) V- Semester**

**Theory (DSE) Syllabus: - Applied Zoology and Developmental Biology**

Paper Code: BSZY501DST	Semester Exam: 70 Marks
Instruction: 4 h / week	Duration: 3 hours
Credits: 4	Internal Assessment: 30 Marks

**Unit I**

- 1.1: Introduction to Host-parasite Relationship Host, Definitive host, Intermediate host,
- 1.2: Parasitism, Reservoir, Zoonosis, Symbiosis, Commensalism. Examples of bacterial diseases, protozoan and helminth diseases
- 1.3: Insects of Economic importance - Pests : Biology, Control and damage caused by *Helicoverpa armigera*, *Pyrilla perpusilla* and *Papilio demoleus*, *Callosobruchus chinensis*, *Sitophilus oryzae* and *Tribolium castaneum*; *Pediculus humanus corporis*, *Anopheles*, *Culex*, *Aedes*, *Xenopsylla cheopis*
- 1.4: Useful Insects - Honey bee : social organization, importance of apiculture, bee products. Silk worm and lac insect: Economic importance Commencement

**Unit II**

- 2.1: Animal Husbandry- Preservation and artificial insemination in cattle; Induction of early puberty and synchronization of estrus in cattle
- 2.2: Poultry Farming- Principles of poultry breeding, Management of breeding stock and broilers, Processing and preservation of eggs
- 2.3: Introduction to Pisciculture, Genetic improvements in aquaculture industry; Induced breeding and transportation of fish seed

**Unit III**

- 3.1: Introduction - Historical Perspective, Theories of Preformation, Epigenesis, Recapitulation and Germplasm, Determinate and Indeterminate types of development, Germ layers and Derivatives.
- 3.2: Types of eggs - Classification of eggs based on: the amount, distribution of yolk and presence or absence of shell; the development (determinate & indeterminate); egg membranes;
- 3.3: Cleavage and cell lineage - Types of cleavage with examples: based on planes ; based on amount of yolk ; based on development ; based on Pattern (Radial & Spiral). Cell lineage studies in Planocera; Different types of blastulae.
- 3.4: Development of Frog - Fertilization, Cleavage, Blastulation & fate map, Gastrulation, (Morphogenetic movements) and formation of germ layers,



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neurulation & notochord formation, mesoderm and coelom formation; organogeny of brain and eye; hormonal control of amphibian metamorphosis.

#### Unit IV

- 4.1: Development of Chick - Fertilization, Structure of egg; cleavage, blastulation, gastrulation and formation of germ layers; Salient features of chick embryo at primitive streak stage, 24 & 33, 48 hours stage; Development and functions of extra embryonic membranes.
- 4.2: Development of Man - Cleavage and formation of morula, development of blastocyst, implantation, gastrulation up to the formation of germ layers. Cell Differentiation and Gene action during development, Cell differentiation, totipotency, pluripotency, Dedifferentiation and Redifferentiation; controlled gene expression during development, Homeotic genes, Mention Hox genes; Stem cells, their significance and applications .
- 4.3: Experimental Embryology - Construction of fate map, Vital staining, Marking with carbon particles & radio active tracing.



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**DSE - Applied Zoology and Developmental Biology**

**Practicals**

Paper Code: BSZY550CCP	Semester Exam:	35 Marks
Instruction: 4 h / week	Duration:	3 hours
Credits: 2	Internal Assessment:	15 Marks

1. Study of arthropod vectors associated with human diseases: *Pediculus*, *Culex*, *Anopheles*, *Aedes* and *Xenopsylla*.
2. Study of insect damage to different plant parts/stored grains through damaged products/ photographs.
3. Identifying feature and economic importance of *Helicoverpa (Heliothis) armigera*, *Papilio demoleus*, *Pyrilla perpusilla*, *Callosobruchus chinensis*, *Sitophilus oryzae* and *Tribolium castaneum*
4. Visit to poultry farm or animal breeding centre. Submission of visit report
5. Maintenance of freshwater aquarium.
6. Frog - Study of developmental stages - whole mounts and sections through permanent slides - cleavage stages, blastula, gastrula, neurula, tail bud stage, tadpole external and internal gill stages.
7. Study of the different types of placenta- histological sections through permanent slides or photomicrographs.
8. Study of placental development in humans by ultrasound scans.
9. Examination of gametes - frog/rat - sperm and ova through permanent slides or photomicrographs.

**Suggested Readings**

- \* Gilbert, S. F. (2006). Developmental Biology, VIII Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA.
- \* Balinsky, B.I. (2012). An introduction to Embryology, Cengage Learning India
- \* Carlson, Bruce M (1996). Patten's Foundations of Embryology, McGraw Hill, Inc.
- \* Park, K. (2007). Preventive and Social Medicine. XVI Edition. B.B Publishers.
- \* Arora, D. R and Arora, B. (2001). Medical Parasitology. II Edition. CBS Publications and Distributors.
- \* Kumar and Corton. Pathological Basis of Diseases.
- \* Atwal, A.S. (1986). Agricultural Pests of India and South East Asia, Kalyani Publishers.
- \* Hafez, E. S. E. (1962). Reproduction in Farm Animals. Lea & Fabiger Publisher



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- \* Dunham R.A. (2004). Aquaculture and Fisheries Biotechnology Genetic Approaches. CABI publications, U.K.
- \* Pedigo, L.P. (2002). *Entomology and Pest Management*, Prentice Hall.
- \* Verma & Agarwal (2010). Chordate Embryology, S. Chand Publishers
- \* Shukla, G.S. & Upadhyay, V.B. (2014). Applied And Economic Zoology, Rastogi Publications

### B.Sc. (Life Sciences) VI- Semester

#### Animal Biotechnology (DSE)

##### Theory Syllabus

Paper Code: BSZY601DST

Semester Exam: 70 Marks

Instruction: 4 h / week

Duration: 3 hours

Credits: 4

Internal Assessment: 30 Marks

#### Unit I: Animal Cell and Tissue Culture

Concept and scope of Biotechnology; Introduction to cell and Tissue culture-Sources of cell; Primary culture-Techniques of cells isolation (Mechanical; Enzymatic Disaggregations), Basic requirements and laboratory management for cell/tissue culture, Culture media (Natural and Artificial) composition and preparation; Sterilization; Cryopreservation; Isolation of Cell lines- Large scale culture of cell lines, Types of cultured cells, Application of organ culture and cell culture products.

#### Unit II: Molecular Techniques in Gene manipulation

Recombinant DNA Technology: Creation of recombinant DNA, Restriction endonucleases, methods of ligation, DNA ligases, ligation of fragment with cohesive and blunt ends; Features of cloning vectors- Plasmids, Cosmids, Phagemids, Lambda Bacteriophage, M13, BAC, YAC, MAC and Expression vectors (characteristics) Screening: Colony hybridization and plaque hybridization. Transformation techniques: Calcium chloride method and electroporation. Southern, Northern and Western blotting; DNA sequencing: Sanger method, Polymerase Chain Reaction, DNA Finger Printing and DNA micro array

#### Unit III: Genetically Modified Animals

Production of cloned and transgenic animals: Methods of Genetic manipulations in animals; Pronuclear Transfer of genes, Microinjection, Use of embryonic stem cells, Retroviral Vectors Transmission of Transgenes in brief; Nuclear Transfer Applications of transgenic Livestock: Production of pharmaceuticals and biomolecules. production of donor organs, knockout mice.

#### Unit IV: Applications in Human Health



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Molecular diagnosis of genetic diseases (Cystic fibrosis, Sickle cell anaemia); Expressing cloned genes in mammalian cells, Recombinant DNA in medicines: Recombinant insulin and human growth Hormone, An over view on Gene therapy, stem cell therapy, Importance of stem cell. Bio safety and ethical issues.

**B.Sc. (Life Sciences) VI- Semester**

**Animal Biotechnology (DSE)**

**Practicals Syllabus**

Paper Code: BSZY650DSP

Semester Exam: 35 Marks

Instruction: 4 h / week

Duration: 3 hours

Credits: 2

Internal Assessment: 15 Marks

1. Primary cell culture of fish organ.
2. Restriction digestion of plasmid DNA/genomic DNA.
3. PCR for cloning a DNA segment
4. Construction of circular and linear restriction map from the data provided.
5. Calculation of transformation efficiency from the data provided.
6. To study following techniques through photographs  
(a) Southern Blotting (b) Northern Blotting (c) Western Blotting (d) DNA Sequencing by Sanger's Method (f) DNA fingerprinting.
7. Good Laboratory Practices (GLP).

**Suggested books:**

- \* Brown, T.A. (1998). Molecular Biology Labfax II: Gene Cloning and DNA Analysis. II Edition, Academic Press, California, USA.
- \* Glick, B.R. and Pasternak, J.J. (2009). Molecular Biotechnology - Principles and applications of Recombinant DNA. IV Edition, ASM press, Washington, USA.
- \* Griffiths, A.J.F., J.H. Miller, Suzuki, D.T., Lewontin, R.C. and Gelbart, W.M. (2009). An Introduction to Genetic Analysis. IX Edition. Freeman and Co., N.Y., USA.
- \* Snustad, D.P. and Simmons, M.J. (2009). Principles of Genetics. V Edition, John Wiley and Sons Inc.
- \* Watson, J.D., Myers, R.M., Caudy, A. and Witkowski, J.K. (2007). Recombinant DNA Genes and Genomes- A Short Course. III Edition, Freeman and Co., N.Y., USA.



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Department of Zoology

- \* Beauchamp, T.I. and Childress, J.F. (2008). Principles of Biomedical Ethics. VI Edition, Oxford University Press.
- \* Kumaresan, V (2014). Animal Biotechnology. Saras Publications
- \* Singh, B. & Gautam, S.K. (2013). Textbook of Animal Biotechnology Paperback. The Energy and Resources Institute, TERI

**B.Sc. (Life Sciences) V-SEM**  
**SEC – Sericulture**  
**UGZY501SET**

Paper Code: UGZY501SET  
Instruction: 2 h / week  
Credits: 2

Semester Exam: 35 Marks  
Duration: 2 hours  
Internal Assessment: 15Marks

**Unit 1:** Sericulture: Definition, Prospectus of Sericulture in India: Sericulture industry in different states, employment, potential in mulberry and non-mulberry sericulture. Silk route. Types of silkworms, Distribution and Races, Exotic and indigenous races, Mulberry and non-mulberry Sericulture, Biology of Silkworm, Life cycle of Bombyx mori, Structure of silk gland and secretion of silk.

**Unit II:** Rearing of Silkworms, Selection of mulberry variety and establishment of mulberry garden, Rearing house and rearing appliances, Disinfectants: Formalin, bleaching powder, RKO, Silkworm rearing technology: Early age and Late age rearing, Types of mountages, Spinning, harvesting and storage of cocoons, Pests and Diseases, Pests of silkworm: Uzi fly, dermestid beetles and vertebrates, Pathogenesis of silkworm diseases: Protozoan, viral, fungal and bacterial, Control and prevention of pests and diseases.





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**B.Sc. (Life Sciences) VI- Semester**  
**Medical Diagnostics (SEC)**  
**Theory Syllabus**

Paper Code: UGZY601SET

Semester Exam: 50 Marks

Instruction: 2 h / week

Duration: 2 hours

Credits: 2

Internal Assessment: 15 Marks

**Unit 1: Introduction and Diagnostics Methods Used for Analysis of Blood & urine:**

Introduction to Medical Diagnostics and its Importance; Blood composition, Preparation of blood smear and Differential Leucocyte Count (D.L.C) using Leishman's stain, Platelet count using haemocytometer, Erythrocyte Sedimentary Rate (E.S.R), Packed Cell Volume (P.C.V.); Urine Analysis: Physical characteristics; Abnormal constituents

**Unit 2: Infectious Diseases and Non-infectious Diseases:**

An overview on Bacterial and Viral Infections with focus on Tuberculosis and Hepatitis: Causes, types, symptoms, diagnosis and prevention; An overview on Non-Infectious diseases with focus on Diabetes and Hypertension - Causes, types, symptoms, complications, diagnosis and prevention. Testing of blood glucose using Glucometer/Kit, Tumor: Types (Benign/Malignant), Detection and metastasis; Medical imaging: X-Ray of Bone fracture, PET, MRI and CT scan (using photographs).